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Sixty-five presents were announced as having been received since the last meeting, including, among others :—

Annals of the Royal Observatory, Cape of Good Hope, vol. 11 (S. S. Hough, Heliometer triangulation of the southern circumpolar area) ; Harvard College Observatory Annals, vol. 51 (W. H. Pickering, Photographic Atlas of the Moon) ; Helsingfors Observatory, Catalogue photographique du Ciel, coordonnées rectilignes, &c., tome 4; Rome, Specola Vaticana, Catalogo fotografico stellare coordinati rettilinei &c., vol. 1 (presented by the Observatories).

Two Drawings of the Mare Serenitatis by John Russell, R.A., affording some hitherto unpublished evidence as to the appearance of Linné in the year 1788. By Arthur A. Rambaut, F.R.S., Radcliffe Observer.

In the *Monthly Notices* of the Royal Astronomical Society, vol. lvi. p. 3, appears a paper, by the late Mr. Stone, entitled "Note on a Crayon Drawing of the Moon, by John Russell, R.A., at the Radcliffe Observatory, Oxford." In this paper a passing reference is made to a large number of detailed pencil drawings of different portions of the Moon's surface, which are also in the possession of the Radcliffe trustees, and a photographic reproduction of one of them is given in the paper ; but no particulars are afforded with respect to them, Stone's attention being confined to the large picture representing the gibbous Moon, which still hangs in the library of the Radcliffe Observatory, and of which a photographic reproduction is also given in the paper.

Russell's drawings, which were for the most part made on separate sheets of paper, are all contained in a large folio volume bound in russia leather, and were presented to the Radcliffe Observatory by his grandson, Rev. S. H. Russell, B.D., on August 4, 1873. This volume contains 187 separate telescopic studies of limited regions of the lunar surface. They are all carefully mounted and protected from injury by sheets of tissue paper ; and although now more than 100 years old, having with one exception been made between 1785 and 1797, they are still in a very good state of preservation. Many of the drawings have memoranda in Byrom's system of shorthand written upon them, giving in most cases the date on which the drawing was made, but unfortunately this particular is sometimes omitted, and in such cases the only clue to the date of the drawing is afforded by its position in the volume with regard to the other dated drawings and the approximate phase of the Moon indicated by the drawing itself. I have, however, so far been unable to ascertain by whom and on what system the studies were arranged ; and as in some cases the year given is manifestly incorrect, this clue cannot always be relied upon. Such errors can, however, generally be

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Fig. 1.

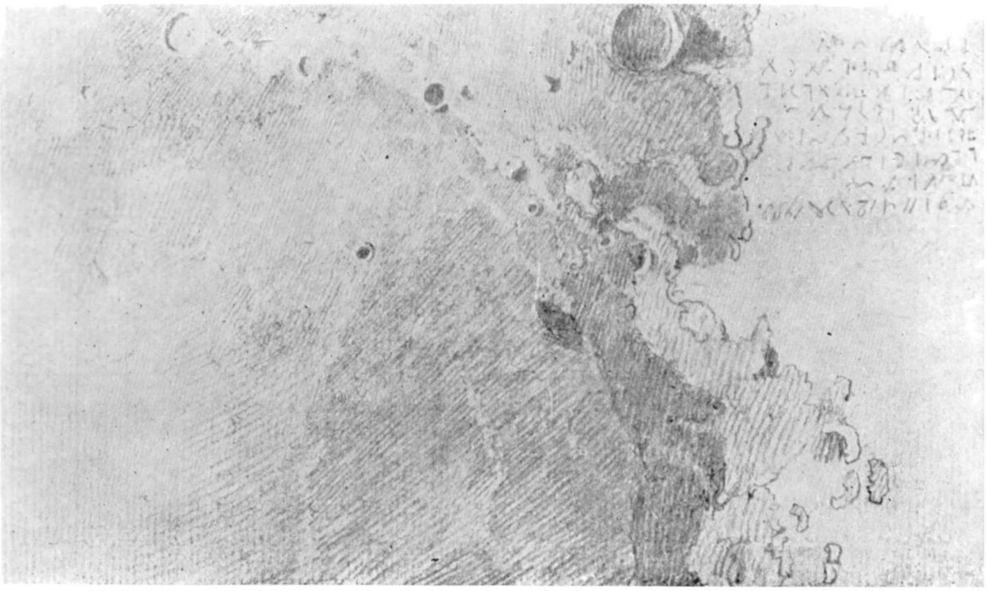
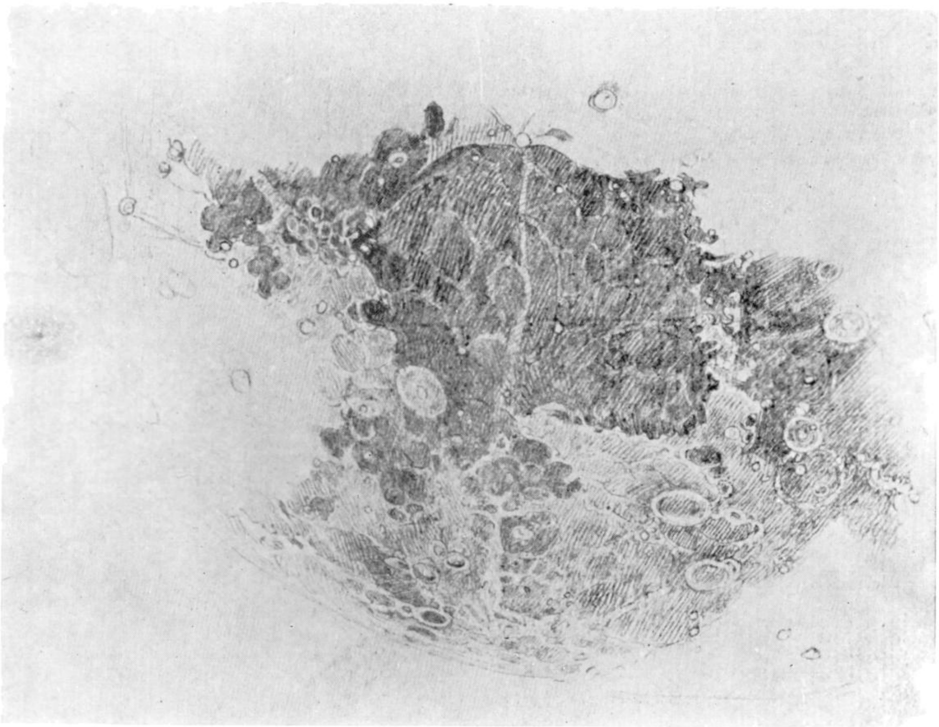


Fig. 2.



DRAWINGS OF THE MARE SERENITATIS, BY JOHN RUSSELL, R.A. 1788.

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corrected without difficulty. As, for instance, when he writes, "1/2 after 7 in the evening 1790 January 19. Full Moon to-morrow at 6 in the morning." The full Moon of January 1790 occurred at 7 P.M. on the 30th, whereas in the following year it occurred at 6 A.M. on the 20th. Whence it is clear that the mistake is of a sort that most of us have made from time to time, especially in the month of January.

From a memorandum left by Professor Rigaud, we find that "Mr. R. had a 6-feet reflector of Dr. Herschell's with which he observed, and also a telescope provided with a micrometer: with this he took all his own measures."

We have no information as to the aperture or focal length of the latter instrument, but are told that it was an achromatic telescope, and that with it most of Russell's observations were made; "for, although Dr. Herschel had provided him with a reflector, Mr. Russell made very little use of it." On the same authority we learn: "Mr. R. always preferred a low power in examining the Moon."

My attention has recently been directed to these drawings by Mr. S. A. Saunder, F.R.A.S., in connexion with the question as to possibility of change in Linné. At his request I have had these drawings examined with a view to ascertaining what evidence they may afford with regard to the condition of this marking in Russell's time. Out of the 187 drawings it is found that only two represent this object. The first of these, which is represented in Plate 3, fig. 1, is particularly interesting.* In the original Linné is somewhat whiter and more conspicuous than it appears in fig. 1, Plate 3. Owing to the age of the paper on which the drawing was made, some effect of contrast has been lost in the process of reproduction. As indicated by the shorthand note inscribed upon it, this drawing represents the appearance of the Mare Serenitatis from 9 to 11 on 1788 April 12. It was thus executed in the same year as Schröter's drawing † of 1788 November 5, and under very nearly the same conditions as to the phase of the Moon. The shorthand note on this drawing runs as follows: "From 9 to 11 on the 12th April, 1788. First quarter to-morrow noon. This was drawn to show the small circular pit situated upon the white line, that it is deeper than the general surface, yet empty, the shadow of the rim bearing no proportion with the hollow centre." The rest of the legend is rather obscure, some of the characters being indistinct; but as the small circular pit referred to is Bessel, not Linné, this is not of so much consequence. Opposite Manilius, and just beyond the terminator, are the words "too large" in shorthand.

On this drawing Linné is represented as a small white spot

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* The dark marking which appears on the surface of the Mare about halfway between Linné and Sulpicius Gallus is a stain on the paper, and not part of the original drawing.

† *Selenotopographische Fragmente*, vol. i., plate ix.

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without any indication of a crater-like depression. On the southern side a slightly darker shading is faintly indicated, but whether this is intentional or due to some inequality in the paper or other accident it is impossible to say. From its position it cannot be the shadow of a crater ring. As represented in the drawing before us, this object resembles nothing so much as the appearance it offers at the present day with a small telescope and under fairly good conditions of seeing, or on a photograph of this region.

The other drawing, Plate 3, fig. 2, represents on a smaller scale the Mare Serenitatis and the region to the north of it. Unfortunately this is one of the undated pictures, but there is little doubt that it belongs to the same year (1788) as the other, and the state of the shadows shows that it was taken very near the time of full Moon. The only particulars given by Russell with this drawing are the names of three craters near the limb, written in longhand, "Zoroaster, Thales, Endimion" (sic). In this drawing Linné is represented as a conspicuous white spot, with perhaps a slight shading to the south. The absence of any indications of a crater within the white spot in this drawing is not under any circumstances to be wondered at, the illumination being almost vertical at the time. Even Menelaus, Bessel, and Sulpicius Gallus, which in the former drawing appear under an oblique illumination as deep well-marked cavities, are here represented as uniformly white patches. A remarkable feature of this drawing is the relatively large size of Linné. It is here represented as more conspicuous than Bessel, which exceeds it in size in the previous drawing, and about equal to Sulpicius Gallus A. In view, however, of the fact that the first of Russell's drawings was intended chiefly to exhibit the appearance of Bessel, and not Linné, it would be unsafe to attach much weight to the apparent rise in conspicuousness of the latter marking as the phase increases. Such a deduction would be opposed to the result of Professor W. H. Pickering's observations, viz. that it rapidly diminishes in size under the direct solar rays, attaining its minimum diameter about twenty-four hours after lunar midday.

It is not my intention at present to enter upon the general question as to the possibility of a change having occurred in Linné. The principal facts bearing on this point have been recently discussed by Mr. Saunder in his presidential address to the British Astronomical Association, and by Professor W. H. Pickering in the *Annals of Harvard College Observatory*, vol. xxxii., part ii., chap. vii. It is not to be supposed that the observations of such experienced selenographers as Lohrmann, Mädler, and Schmidt (who frequently studied this formation and described it as having been previous to 1843 a large and deep crater, which disappeared in the year 1866)* can be lightly set aside. At the same time the evidence afforded by these drawings of Russell, now published for the first time, corroborates

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* See *Report of British Association*, 1867.

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in a remarkable manner Schröter's isolated observation, and renders it probable that in the year 1788 this object presented much the same appearance as at the present day when viewed with a low power eyepiece attached to a small telescope.

I would merely venture to point out that the evidence of Grimaldi's two maps, as published by Riccioli in his *Almagestum Novum*, which is sometimes appealed to as proof of the existence of a large crater at this spot about the middle of the seventeenth century, appears to me to be of very little value indeed. In one of these two maps Linné is represented as a white spot, while Bessel and Sulpicius Gallus appear as craters with shaded interiors. In the other map, which seems to be the more carefully finished production, Linné is also provided with a shaded crater-like interior, in every way comparable with that of Sulpicius Gallus. The force of this evidence in favour of the crater-like form of Linné in 1651 is, however, very much weakened, if not entirely dissipated, by the fact that the peaks of the Apennine range, which in the former map are represented as white spots similar to but smaller than Linné, appear in the latter as a row of small carefully shaded craterlets.

Studies of Mersenius and Copernicus—both of which have been suspected of change—are also included amongst Russell's drawings.

Transformation of Hansen's Tables. By P. H. Cowell, M.A.

Newcomb (*Astron. Papers, Amer. Eph.* vol. i.) has transformed Hansen's theory into longitude and latitude in order to compare it with Delaunay. In this paper I give the transformation of Hansen's tables in order to compare them with the observations. Newcomb's paper has, of course, been of great assistance. It will be seen that my method is to vary Newcomb's results, and thus avoid performing the long calculations that would have been necessary in the absence of his paper.

Hansen's longitude is found from the formula

$$L = f + \Pi + R + R'$$

where f, R, R′ are functions of e, I, $n\delta z$, s, and Hansen's latitude β is found from the formula

$$\sin\beta = \sin I \sin(f + \omega) + s$$

e and I are arbitrary constants to which Hansen assigns one value in the theory and a different value in the tables. $n\delta z$ and s are the symbols under which Hansen calculates the perturbations. As regards these quantities Hansen gives slightly different coefficients in his tables to those that he subsequently